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## Claims

1 What is claimed is

1 1. A graphics controller circuit for upscaling a  
 2 source video image to generate an upscaled video image, the  
 3 source video image comprising a plurality of scan lines with  
 4 each scan line comprising a set of pixel data, the graphics  
 5 controller circuit comprising  
 6 an encoder circuit for receiving a set of pixel data  
 7 for a first scan line of the source video image and  
 8 generating a compressed data set corresponding to the set of  
 9 pixel data for the first scan line;

10 a local memory coupled to receive and store the  
 11 compressed data set;

12 a decoder circuit for retrieving the compressed data  
 13 set in the local memory and for decompressing the compressed  
 14 data set to generate a decompressed pixel data set; and

15 an interpolator for receiving the decompressed pixel  
 16 data set and a set of pixel data for a second scan line of  
 17 the source video, the interpolator interpolating the  
 18 decompressed pixel data set and the set of pixel data for  
 19 the second scan line to generate a set of additional pixel  
 20 data comprised in the upscaled video image.

1 2. The graphics controller circuit of claim 1 wherein  
 2 a display memory is provided for storing the set of pixel

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3 data for the first scan line and the set of pixel data for  
4 the second scan line prior to being received by the encoding  
5 circuit and the interpolator respectively.

1 3. The graphics controller circuit of claim 1 wherein  
2 the decoder circuit comprises a DPCM decoder and the encoder  
3 circuit comprises a DPCM encoder.

1 4. The graphics controller circuit of claim 3 wherein  
2 the DPCM decoder compresses the set of pixel data for the  
3 first scan line such that resulting compressed data set  
4 comprises half the number bits compared to the number of  
5 bits in the set of pixel data for the first scan line.

1 5. The graphics controller circuit of claim 3 wherein  
2 the interpolator comprises a polyphase interpolator.

1 6. The graphics controller circuit of claim 3 wherein  
2 the DPCM encoder comprises

3 a first adder for receiving pixel data and a predicted  
4 value, the first adder generating a difference of the pixel  
5 data and the predicted value;

6 a quantizer for generating the compressed data set by  
7 quantizing the difference;

8 a recoverer circuit for generating a recoverer value

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1        7. The graphics controller circuit of claim 6 wherein  
2        the predictor comprises a set of flip-flops each for  
3        storing a bit of the output of the second adder.

1        9. The graphics controller circuit of claim 8 wherein  
2 the override circuit avoids the overload condition by  
3 changing a predicted value to correspond to a present pixel  
4 data value.

1        11. The graphics controller circuit of claim 10

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2 further comprising

3 a video controller for sending a set of graphics

4 pixels; and

5 a multiplexor for receiving the graphics pixels and

6 pixel data of the upscaled video image, and for selectively

7 sending to a display unit one of the graphics pixels and

8 pixel data of the upscaled video image.

1 12. The graphics controller circuit of claim 11

2 wherein the encoder circuit receives pixel data of the first

3 scan line from a display memory.

1 13. A computer system for displaying a source video

2 image on a display unit, said source video image comprising

3 a plurality of scan lines with each scan line comprising a

4 set of pixel data, said computer system comprising

5 a display memory for storing graphics/text data;

6 a display unit; and

7 a graphics controller circuit receiving pixel data of

8 said source video image and said graphics/text data, and

9 upscaling said source video image to generate an upscaled

10 video image prior to displaying said graphics/text and said

11 upscaled source video image on said display unit, said

12 graphics controller circuit comprising:

13 an encoder circuit for receiving a set of pixel

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14 data for a first scan line of the source video image  
 15 and generating a compressed data set corresponding to  
 16 the set of pixel data for the first scan line;  
 17 a local memory coupled to receive and store the  
 18 compressed data set;  
 19 a decoder circuit for retrieving the compressed  
 20 data set in the local memory and for decompressing the  
 21 compressed data set to generate a decompressed pixel  
 22 data set; and  
 23 an interpolator for receiving the decompressed  
 24 pixel data set and a set of pixel data for a second  
 25 scan line of the source video, the interpolator  
 26 interpolating the decompressed pixel data set and the  
 27 set of pixel data for the second scan line to generate  
 28 a set of additional pixel data comprised in the  
 29 upscaled video image.

1 14. The computer system of claim 13 wherein the  
 2 display memory stores the set of pixel data for the first  
 3 scan line and the set of pixel data for the second scan  
 4 line.

1 15. The computer system of claim 13 wherein the  
 2 decoder circuit comprises a DPCM decoder and the encoder  
 3 circuit comprises a DPCM encoder.

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1 16. The computer system of claim 15 wherein the DPCM  
 2 decoder compresses the set of pixel data for the first scan  
 3 line such that resulting compressed data set comprises half  
 4 the number bits compared to the number of bits in the set of  
 5 pixel data for the first scan line.

1 17. The computer system of claim 15 wherein the  
 2 interpolator comprises a polyphase interpolator.

1 18. The computer system of claim 15 wherein the DPCM  
 2 encoder comprises:  
 3 a first adder for receiving pixel data and a predicted  
 4 value, the first adder generating a difference of the pixel  
 5 data and the predicted value;  
 6 a quantizer for generating the compressed data set by  
 7 quantizing the difference;  
 8 a recoverer circuit for generating a recoverer value  
 9 from the compressed data set;  
 10 a second adder for adding the recoverer value with the  
 11 predicted value to generate an output; and  
 12 a predictor for generating the predicted value as a  
 13 function of the output of the second adder.

1 19. The computer system of claim 18 wherein the  
 2 predictor comprises a set of flip-flops each for storing a

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3 bit of the output of the second adder.

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1 20. The computer system of claim 18 further comprising  
2 a override circuit to avoid a overload condition in DPCM  
3 decoding and encoding.

1 21. The computer system of claim 20 wherein the  
2 override circuit avoids the overload condition by changing a  
3 predicted value to correspond to a present pixel data value.

1 22. The computer system of claim 20 further comprising  
2 an MVA block wherein the MVA block comprises the DPCM  
3 encoder, the DPCM decoder, the override circuit and the  
4 local memory.

1 23. The computer system of claim 22 further comprising  
2 a video controller for sending a set of graphics  
3 pixels; and

4 a multiplexor for receiving the graphics pixels and  
5 pixel data of the upscaled video image, and for selectively  
6 sending to a display unit one of the graphics pixels and  
7 pixel data of the upscaled video image.

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1 24. A method of upscaling a source video image in a  
2 graphics controller circuit, said source video image

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3 comprising a plurality of scan lines with each scan line  
 4 comprising a set of pixel data, said method comprising the  
 5 steps of  
 6 receiving a first scan line of said source video image;  
 7 compressing the pixel data corresponding to said first  
 8 scan line to generate a compressed data;  
 9 storing said compressed data in a local memory;  
 10 retrieving a second scan line of said source video  
 11 image;  
 12 retrieving said compressed data from said memory  
 13 circuit;  
 14 decompressing said compressed data to generate said  
 15 pixel data;  
 16 generating a set of additional pixels by interpolating  
 17 pixels in said first scan line and said second scan line  
 18 wherein said additional pixels are comprised in an upscaled  
 19 image of said source video image.

1 25. The method of claim 24 wherein said step of  
 2 compressing comprises the step of using differential pulse  
 3 code modulating (DPCM).

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1 26. The method of claim 25 further comprising the  
 2 steps storing said source video image in a display memory  
 3 wherein said step of receiving receives said first scan line



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4 from said display memory.

1        27. The method of claim wherein said step of using  
2 DPCM generates said compressed data comprising one half the  
3 number of bits compared to number of bits in the pixel data  
4 of said first scan line in the source video image.

1        28. A graphics controller circuit for displaying a  
2 source video image on a display unit, said source video  
3 image comprising a plurality of scan lines with each scan  
4 line comprising a set of pixel data, said graphics  
5 controller circuit comprising  
6        a DPCM encoder circuit for receiving a set of pixel  
7 data for a first scan line of said source video image and  
8 generating a compressed data set using DPCM encoding scheme  
9 corresponding to the set of pixel data of the first scan  
10 line;  
11        a local memory coupled to receive and store the  
12 compressed data set;  
13        a DPCM decoder circuit for retrieving said compressed  
14 data set in said local memory and for decompressing said  
15 compressed data set to generate a decompressed pixel data  
16 set;  
17        an interpolator for receiving said decompressed pixel  
18 data set and a set of pixel data for a second scan line of

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19 said source video, said interpolator interpolating the  
20 decompressed pixel data set and the set of pixel data for  
21 the second scan line to generate a set of additional pixel  
22 data comprised in the upscaled image;  
23 a video controller for receiving a graphics/text data  
24 from a host, and generating a corresponding pixel data; and  
25 a multiplexor for selectively forwarding to said  
26 display unit either pixel data corresponding to said  
27 graphics/text data or pixel data of said upscaled image.

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